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The wider contribution of cycling and its potential to replace car journeys

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The purpose of this paper is to consider the wider benefits cycling makes to society and identify the potential for substantially increasing cycling levels in Northern Ireland. Approaches to the appraisal of transport schemes are discussed, with the unique benefits of cycling identified.

The potential for increased cycling levels in Northern Ireland is evaluated based on existing knowledge of travel behavior and attitudes to sustainable transport. The experiences of some of Europe's most cycle friendly cities are discussed.

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Key Points

The Northern Ireland Executive's (NIE) top priority is to support and stimulate the local economy of Northern Ireland; effective transport infrastructure is vital to this.

As well as having a key role in facilitating the free movement of people and goods within Northern Ireland the Department for Regional Development must bring about a reduction in emissions from transport.

This will require a significant cultural shift away from car use towards more sustainable modes, such as walking and cycling.

Transport appraisal had until recently favoured cars by not considering the wider value of cycling which is now known to contribute to better health; less congestion; and better quality of life, all of which yield an economic return.

The extent of the return is based on certain variables, particularly demand.

Cost Benefit Analysis of cycling schemes show they compare strongly against other transport projects. However, as forecasts are based on untested assumptions it remains to be seen how accurate they are.

Analysis of travel behaviour in Northern Ireland suggests car use is habitual, convenient and normal meaning generating sufficient demand for cycling will require a multi-faceted approach from government.

A combination of soft and hard measures have been implemented as a result of the Northern Ireland Cycling Strategy (2000). However, the targets set have not been reached with analysis suggesting the quality of the infrastructure was inadequate.

The potential for increased cycling levels does appear to exist and cycling is a popular recreational activity. However, not enough is known about why people choose to travel the way they do and what, if anything, would make them consider alternatives.

In some Northern European countries cycling is well established as a means of urban transport, accounting for between 35-40% of journeys in some Dutch and Danish cities.

Cycling levels in other European Countries are much more variable

Experience from Europe shows that cycling cultures can be created but many cities are 30 years ahead of the UK in implementing bicycle friendly policies.

Executive Summary

The Northern Ireland Executive's (NIE) top priority is to support and stimulate the local economy of Northern Ireland. The Department for Regional Development must secure the infrastructure to facilitate this growth while at the same time reducing Green House Gas Emissions (GHGE) from transport.

In the current economic downturn, public funds are limited and any potential expenditure must be able to demonstrate it can provide value-for-money. Traditionally economic appraisal favoured motorised travel as it has ability to generate tax from fuel duty. However, the Department for Transport's *New Approach to Transport Appraisal* has recognised the wider impacts of transport. Thus appraisals are now based on environmental, economic, safety, accessibility, and integration objectives.

Up until 2009 there was no established methodology for evaluating the economic costs and benefits of cycle projects. This was significant because cycling is unique in terms of transport, and its benefits to both public health and the environment make potential returns from investment much greater.

Application of the new methodology demonstrates that the Benefit to Cost Ratio (BCR) of cycling projects compares strongly with other transport schemes. Assessments of four case studies indicates that the improvement in the health of new users is the single most significant benefit, while substantial benefits are accrued in terms of journey ambience, and reduced congestion. Overall BCR of cycling initiatives is sensitive to whether increases in cycling are permanent or fall back to pre-programme levels over time.

The Health Economic Assessment Tool (HEAT) is an online resource designed by the Word Health Organisation to estimate the economic savings resulting from reductions in mortality as a consequence of regular cycling and/or walking. HEAT calculates the answer to the following question: if x people cycle or walk y distance on most days, what is the economic value of mortality rate improvements? Application of this tool in Scotland found annual savings of £1-2 billion could be achieved if the cycling's modal share reached 13 per cent from the current level of one per cent (the same as the NI level).

The extent of the value of cycling depends on a number of variables:

- The number of additional cyclists (and additional trips);
- The profile of target group cyclists (age and level of fitness);
- The number of cycle trips that replace car trips; and
- Whether new trips are made in rural or urban environments.

At present in Great Britain using the car for short trips in urban areas is convenient, habitual and normal and although cycling has many potential benefits, all of which

provide an economic return, the extent of this value is dependent on achieving a critical mass of people who are willing or can be convinced to make change an established habit.

Analysis of travel behaviour in Northern Ireland shows a society highly dependent on the private car with very low levels of walking, cycling and public transport use. Despite increasing the use of sustainable transport modes being a strategic objective of DRD, travel behaviour has changed little in the last decade. Failure to significantly alter travel behaviour means that Green House Gas Emissions from transport have risen 38.8% per cent, while all other sectors achieved a reduction.

Research suggests that people are reluctant to move away from their cars. Car use, as it is in GB appears habitual, convenient and normal, meaning government may need to intervene with policies which actively restrict car use, including congestion and car parking charges.

The Northern Ireland Cycling Strategy (2000) aimed to double the number of trips by bicycle by the end of 2005 and quadruple the number of trips by cycle by the end of 2015. The levels achieved were well below these targets with reviews suggesting that poor infrastructure was a factor.

Most European cities experienced a decline in walking and cycling in the late 1960s and early 1970s but for some a key turning point occurred in the early 1970s, when the potential problems of spiralling car ownership began to be recognised. The Netherlands now stands as the exemplar of a bicycle friendly country: cycling is the most popular means of transportation (35%) for distances up to 7.5 km, because it is the most efficient means of travelling to school, to shops and work. Bicycle use in the Netherlands also skews demographic boundaries seen in the UK with men, women and children of all ages and social backgrounds regularly cycling.

In the cities where cycling is most widespread many of the same characteristics are evident, including: effective land use planning; good cycling infrastructure; car restrictive policies; consistent education and marketing; sustained political commitment and cycling policies which are integral to overall traffic and transport policy.

Sustainable travel demonstration towns and cycling demonstration towns provide strong evidence that cycling is a viable alternative to the car for local travel and show that a cycling culture can be created where one had not previously existed.

Contents

1 Introduction

The Northern Ireland Executive's (NIE) top priority is to support and stimulate the local economy of Northern Ireland. Economic growth relies on the free movement of people and goods and it is the Department for Regional Development (DRD), in its remit to secure transport infrastructure that ultimately facilitates this.

While providing infrastructure that meets the economic and social needs of Northern Ireland, DRD must deliver reductions in greenhouse gas emissions from road transport. To date this challenge has not been met; indeed emissions from road transport have escalated in the last ten years making transport the sector in Northern Ireland with the highest emission levels.

In the current economic climate transport infrastructure investments are under pressure and therefore decisions to invest in infrastructure need to be appraised, managed and evaluated on a case by case basis in order to deliver value for money. This requires a broader view of value be taken: one that looks at all of the direct and indirect costs and returns of a project.

One of the DRD's key strategic aims is to increase the proportion of journeys made by sustainable modes. Walking, cycling and public transport have the potential to reduce Northern Ireland's dependence on the private car which has reached a point where it is negatively impacting on the economy, environment, and health of Northern Ireland.

Despite currently having the lowest levels of walking and cycling anywhere in Europe, DRD believes, based on experiences elsewhere, that when active travel is integrated into transport and planning policy it can make a wider contribution to society in terms of better health, productivity, reduced pollution and congestion. These all have the potential to yield economic returns.

To establish the potential extent of these returns two basic questions must be answered: 'How much additional cycling activity do specific investments generate, particularly within the Northern Ireland context?' and 'what is the "value" generated by increasing the amount of cycling activity from the point of view of our health, environment and our economy?'

This purpose of this paper is to consider the wider benefits cycling makes to society and whether these benefits warrant government investment to increase cycling levels in Northern Ireland. This paper will:

- Examine the approaches to appraisal of transport, particularly cycling projects;
- Identify the variables which will determine the success of a scheme, particularly demand forecasting based on analysis of travel behaviour; and
- Compare experiences of increasing cycling in other regions, outline the economic returns experienced and point to how these lessons could be applied in the Northern Ireland context.

2 Economic appraisal of transport infrastructure

The Department for Transport (DfT) requires major scheme proposals to be assessed using the *New Approach to Appraisal* (NATA), a sophisticated method based on cost benefit analysis. NATA was introduced in 1998 to provide more consistent appraisal of public and private transport schemes, and a balanced assessment of economic and environmental benefits, to assist with decision-making within and across modes.[1]

The DfT produce Transport Analysis Guidance (TAG) for transport planners which include advice on the modelling and appraisal for major highway and public transport schemes. Appraisal of walking and cycling schemes was included in a 'refresh' of NATA in April 2009[2] and TAG for walking and cycling projects was published.[3] This meant that for the first time a monetary valuation could be placed on the costs and benefits of cycling and walking schemes such as new cycle routes and road crossings. TAG makes it possible to conduct robust appraisals of cycling schemes which can be directly compared with other transport infrastructure projects.

Transport planners within all the UK legislatures have adopted NATA and are able to access TAG online via WebTAG.[4] This provides advice on how to:

- set objectives and identify problems;
- develop potential solutions;
- create a transport model for the appraisal of the alternative solution; and
- conduct an appraisal

TAG appraisals are based on Environmental, Economic, Safety, Accessibility, and Integration objectives. These are further divided into a number of sub-objectives:

- Environment – noise, local air quality, greenhouse gases, landscape, townscape, biodiversity, heritage of historic resources, water environment, physical fitness, journey ambience
- Safety – accidents, security
- Economy – public accounts, transport economic efficiency, reliability, wider economic impacts
- Accessibility – option value, severance, access to the transport system
- Integration – transport interchange, land use policy, other government policies

DfT suggest that the guidance should be seen as a requirement for all projects/studies that require government approval while for projects/studies that do not require government approval TAG should serve as a best practice guide.

[1] House of Commons Transport Committee (2010) Third report: Transport and the Economy [online] available from: http://nia1.me/gf
[2] DfT (2009) NATA Refresh: Appraisal for a Sustainable Transport System [online] available from: http://nia1.me/gh
[3] DfT (2010) TAG unit 3.14.1: Guidance on the Appraisal of Walking and Cycling Schemes [online] available from: http://nia1.me/g9
[4] DfT [online] see: http://www.dft.gov.uk/webtag/

2.1 The economic value of cycling

A commonly cited problem with NATA was its bias towards cars. For example, it counted the cars ability to generate tax from fuel sales as an economic benefit, whereas increased cycling would actually reduce tax income. Thus it was seen as an economic disbenefit. The 2009 refresh changed this: less car use, rather than being a disbenefit, was now considered a benefit because it meant less congestion, less pollution and when replaced by active modes, the benefits include better health and fitness, all of which benefit the economy.

2.2 Application of NATA - Cost Benefit analysis of cycling

Extensive literature exists dealing with Cost Benefit Analysis (CBA) of transportation projects, but substantially less deals with that of cycling projects. There had previously been no established methodology for evaluating the economic costs and benefits of cycle projects. However, the DfT guidance for the appraisal of walking and cycling schemes sought to correct this. CBA of measures for pedestrians and cyclists apply much of the same methodology that is used for transport projects in general. However, the specific impacts of cycling are also considered.

2.3 Examples of CBA

In the DfT guidance for appraising and walking and cycling schemes example case studies of cost benefit analysis are provided. Two of the case studies were high quality segregated routes, while case study three is for a toucan crossing. All three have extremely high Cost Benefit Ratios (over the 60 year evaluation). The CBR of 1:37.6 (£37.60 returned for every £1 spent) predicted for case study two takes into account the additional impact the London congestion charge has in encouraging modal shift and should therefore not be seen as typical. This of course is unless the circumstance exists where pro-cycling measures are coupled with car-restricting measures.

Table 1: Cost Benefit Analysis of three Transport Schemes

	Case Study 1	Case Study 2	Case Study 3
Project	1 km length of 'Greenway' traffic-free route	6 km High quality traffic free segregated route	A new toucan crossing
Scheme capital cost (adjusted)	£37,200	£193,439	£84,631
Operating costs	£128,923	£773,537	£107,436
Tax revenue lost from modal shift	£9,934	£944,413	£37,995
Greenhouse gases (reduction)	£2,053	£194,308	£7,828
Physical fitness (improvement)	£2,640,862	£38,544,772	£2,770,936
Journey ambience (enhanced)	£81,501	£15,700,934	£836,936
Accidents (reduced)	£34,294	£3,239,936	£130,670
Business users (reduced absenteeism)	£39,285	£2,093,964	£34,628
Net present value	£2,749,575	£69,935,060	£4,037,417
Benefit to cost ratio	**18.4**	**37.6**	**18.5**

Source: DfT (2009)

The CBA of these schemes shows that the primary benefits gained from walk and cycle schemes are physical fitness and journey ambience benefits, with decongestion and other benefits becoming more significant as more people choose to walk or cycle rather than use a car.

2.4 Cycling Demonstration Towns - Background

In 2005, Cycling England launched a Cycling Demonstration Town (CDT) programme to invest in measures to stimulate increased levels of cycling through combinations of physical infrastructure, promotion and other smart measures. The initial competition for funding invited bids from towns with a population of approximately 100,000. The towns selected for funding were chosen from applications by 31 local authorities, on the basis of three principal characteristics:

1. the ambition of their programme to increase short urban trips by bike
2. the commitment and involvement of senior members and officers
3. the commitment by the local authority to match-fund the Cycling England central grant

The first phase of the programme ended in March 2009. The towns selected as Cycling Demonstration Towns were Aylesbury, Brighton and Hove, Darlington, Derby, Exeter and Lancaster with Morecambe. Darlington was also part of the Government's Sustainable Travel Town programme between 2004 and 2009, and received additional funding for implementation of a large scale Smarter Choices Programme.

2.4.1 Funding

The towns chosen received funding of £500,000 per year (approximately £5 per head of population per year), starting in October 2005, and matched by the respective local authorities so that the total level of investment in cycling was at least £10 per head per year. This represented a substantially higher level of investment than the English local authority average, which, at the beginning of the programme, was closer to roughly £1 per head per year.[5]

2.4.2 Outcomes

Using the DFT Guidance for walking and cycling[6] the analysis indicates that the improvement in the health of new users from reduced mortality is the single most significant benefit of the programme accounting for between 70% and 96% of the net benefits. This is consistent with the results of other case studies discussed which

[5] Cope, A., Kennedy, A., Ledbury, M., Camber, R., Parkin, J. and Cavill, N. (2010) Cycling demonstration towns – an economic evaluation. European Transport Conference Proceeding (ETC) [online] available from: http://nia1.me/qc

[6] DfT (2010) TAG unit 3.14.1: Guidance on the Appraisal of Walking and Cycling Schemes [online] available from: http://nia1.me/g9

showed greatest benefits were accrued in terms of health, journey ambience (schemes were greenway upgrades) and reduced congestion.[7]

The outcomes of the CDT programme were positive and it did achieve its primary objective of increasing cycling. The Benefit to Cost ratio (BCR) shown in table three is not as high as those in the previous case studies, but this is determined by the timeframe for the appraisal. The CDT BCR is significant and it compares well to transport schemes which have either been approved (average BCR=6.4) for funding or placed in the development pool (average BCR=3.5) by the DfT in 2011.[8] The value for money guidance states any scheme with a BCR greater than two provides high value for money and is therefore worth pursuing.

Table 3: Benefits and Costs of Cycling Demonstration Towns[9]

Impact	Estimate of costs and benefit over 10 year period (£m, 2007 prices and values)
Reduced mortality	Benefit of £45 million
Decongestion	Benefit of £7 million
Reduced absenteeism	Benefit of £1-3 million
Amenity	Benefit of £9 million
Accidents	Disbenefit of £0-15 million
TOTAL BENEFITS	**£47-64 million**
Costs	£18 million
Benefit-Cost Ratio	2.6-3.5

The economic appraisal does however include the caveat that the overall BCR is sensitive to whether increases in cycling are permanent or fall back to pre-programme levels over time. For example, when assuming 10% growth in demand per annum the benefit to cost ratio ranges from 4.0-5.1:1 when appraised over 10 years. When assuming a 30% per annum reduction in demand this range falls to 0.9-1.3:1.

2.4.3 Do the results indicate a permanent change?

Consistent monitoring is needed to determine whether the increases in cycling rates from typical investments in cycling schemes are experienced over the long term and to what extent their impact declines over time. For example, the CDT programme included an aggressive marketing and education campaign (soft measure) which would encourage people to take up cycling. It may be the case that these measures would need to be repeated as experience would suggest that when the initial enthusiasm for the scheme subsides, participation is also more likely to decline. The impact of hard

[7] DfT (2010) TAG unit 3.14.1: Guidance on the Appraisal of Walking and Cycling Schemes [online] available from: http://nia1.me/g9
[8] DfT (2011) Investment in Local Major Transport Schemes: Update [online] available from: http://nia1.me/gq
[9] DfT (2010) Cycling Demonstration Towns Development of Benefit-Cost Ratios [online] available from: http://nia1.me/gd

measures (infrastructure) is less likely to experience short term decline although these do have maintenance costs to consider.

The current economic analysis does provide some useful insights on the impact of policy measures to increase cycling. However, it also shows that the overall value of these types of schemes is sensitive to assumptions which have yet to be tested.[10] In addition to the assumptions made about the schemes ability to maintain user numbers, other key questions about the accuracy of the BCR include: 'What proportion of cyclists have shifted from using a car?' and 'what was their previous activity/fitness level?'

2.5 Health Economic Assessment Tool (HEAT) for cycling

HEAT is an online resource designed by the Word Health Organisation to estimate the economic savings resulting from reductions in mortality as a consequence of regular cycling and/or walking. It is based on best available evidence, with parameters that can be adapted to fit specific situations.

HEAT calculates the answer to the following question: if x people cycle or walk y distance on most days, what is the economic value of mortality rate improvements?

HEAT can be applied in many situations, for example:

- to plan a new piece of cycling or walking infrastructure: it models the impact of different levels of cycling or walking, and attaches a value to the estimated level when the new infrastructure is in place (this can be compared to the costs to produce a benefit–cost ratio (and help make the case for investment), or as an input into a more comprehensive cost benefit analysis);
- to value the mortality benefits from current levels of cycling or walking, such as benefits from cycling or walking to a specific workplace, across a city or in a country;
- to provide input into more comprehensive cost–benefit analyses, or prospective health impact assessments: for instance, to estimate the mortality benefits from achieving national targets to increase cycling or walking, or to illustrate potential cost consequences of a decline in current levels of cycling or walking.[11]

2.5.1 Examples of application

Transform Scotland, a Scottish alliance for sustainable transport, used HEAT for cycling to estimate the benefits from both conservative (20%) and more ambitious (40%) targets of journeys under 5 miles being completed by bicycle. These represent cycle rates for all distances of 13% and 27%, respectively. These estimates refer to the Scottish working-age population (aged 15–64). Annual savings would amount to £1–2 billion if the cycle share reached 13% from the current level of 1% per cent.

[10] Cope, A., Kennedy, A., Ledbury, M., Camber, R., Parkin, J. and Cavill, N. (2010) Cycling demonstration towns – an economic evaluation. European Transport Conference Proceeding (ETC) [online] available from: http://nia1.me/gc
[11] WHO(2011) Health economic assessment tool (HEAT) for cycling and walking [online] available from: http://nia1.me/h8

Another example of a city with low cycling levels that has used HEAT is Pilsen in the Czech Republic. A study by the Charles University Environment Centre (Czech Republic) showed that two per cent of participants would be ready to take up regular cycling if the infrastructure were improved. Assuming an average of two cycling trips per day, the mortality savings from such an increase in cycling would result in discounted annual savings of €882,000. The calculation was based on a representative study on travel behaviour in 764 people. The study included questions on willingness to change travel means, provided certain improvements in the transport infrastructure would be made.[12]

2.6 What is the extent of value?

Research undertaken by SQW Ltd on behalf of Cycling England concluded that these wider benefits must be considered together to fully understand the potential value of cycling. However, the extent of the value depends on a number of variables:[13]

- The value of cycling increases with the more people who cycle;
- There is greater benefit in getting previously inactive and older people to cycle;
- The value of substituting cycling for car trips is higher than those that replace other modes; and
- The value of replacing urban trips is higher than rural trips.

A significant obstacle to overcome when planning to invest in cycling is establishing whether or not it will actually get people onto their bikes. Research shows that although most people are in favour of cycling most still don't do it. It is often assumed that short trips could easily be made by bicycle or on foot, but a purely distance based understanding of the problem ignores difficulties caused by the physical environment, in terms of safety; unpredictable weather; complex household interactions like transporting children; and a perception that walking and cycling are not normal modes of transport.[14]

> *"The key that comes from this research is that at present in Britain using the car for short trips in urban areas is convenient, habitual and normal. It is what people expect to do, what most people expect others to do and what many other people who have yet to benefit from car ownership aspire to do. Alternatives to the car – especially cycling and walking – are perceived to take too much effort, need planning and equipment that causes hassle, and may be risky and uncomfortable".*[15]

What this tells us is that cycling has many potential benefits, all of which provide an economic return. However, this value is dependent a achieving a critical mass of people who are willing or can be convinced to make change an established habit.

[12] WHO (2011) Examples of applications of the health economic assessment tool (HEAT) for cycling [online] available from: http://nia1.me/h9

[13] SQW Ltd. (2010) Understanding walking and cycling

[14] Ibid

[15] Ibid

3 Appraisal of walking and cycling schemes in Northern Ireland

The first logical step in the development of any product is to identify whether there is sufficient demand to warrant investment:

> *"It is of crucial importance to forecast demand of walk and cycle use as accurately as possible in order to produce a successful appraisal. It is also of importance to estimate the resulting change in use of other modes in order to fully appreciate the impact of a scheme".*[16]

TAG recommend three approaches to forecasting demand, these are:

- Comparative study – This is the most simple and low-cost option involving making comparisons with other schemes similar to the one being proposed;
- Estimating from disaggregate mode choice models – This method uses existing data to express the probability that a person or group with similar socioeconomic characteristics, faced with a number of travel choices, will choose to walk or cycle; and
- Sketch plan methods – These are a series of simple calculations to estimate the number of bicyclists or pedestrians using a facility. These methods generally rely on data that already exist or can be collected with relative ease (such as census and land use data), and can be combined with behavioural assumptions derived from other studies.

3.1 Travel behaviour

In the context of Northern Ireland, a great deal of data already exists on which forecasts for demand may be based. Analysis of travel behaviour in Northern Ireland shows a society highly dependent on the private car. RaISe paper 421-11[17] discusses issues around car dependency and travel behaviour in greater detail. The key points can are summarised below:

- Car dependency in Northern Ireland is escalating, despite targeted policies to reduce it over the last ten years;
- The rural nature of the country is a major factor. Land use planning, centralisation of employment and services and a lack of investment in public transport, particularly outside Belfast, has exacerbated the problem;
- In many places where car ownership is high, public transport and active travel modes make considerable contributions to the modal split. In Great Britain (GB), for example, car ownership is higher than in NI; however, statistics show that the average person there makes 64 per cent of all journeys by car compared to 72 per

[16] DfT (2010) TAG unit 3.14.1: Guidance on the Appraisal of Walking and Cycling Schemes [online] available from: http://nia1.me/g9

[17] http://www.niassembly.gov.uk/regional/2011mandate/research/Car_dependency.pdf

cent in in NI, while in NI only 5 per cent of journeys are made on public transport compared to 10 per cent in GB.[18]

- Active travel modes are also less prevalent in Northern Ireland. 17 per cent of short journeys (averaging 0.8 miles) are made on foot compared to 22% in GB, while just one per cent (averaging 3.3 miles) were made on a bicycle (GB=2%). This problem is exacerbated by the prevalence of single occupancy cars,[19] and contributes to Belfast being the third most congested city in GB and tenth most congested in Europe.[20]
- Over 86 per cent of people in Northern Ireland use a car to travel to work while in GB this is 70 per cent[21]
- The average person in Northern Ireland makes 30% of their journeys, less than one mile, in a car; 68% of journeys between one and two miles by car; and 85% of journeys from 2 to 5 miles by car.

Analysis of the Travel Survey throughout the last decade shows little evidence of modal shift, with car use and walking levels in 2009 remaining at 1999 levels.[22] Car ownership and the number of licence holders has increased in this time, while there remains scope for car ownership levels to rise further, in line with GB levels.

Failure to significantly alter travel behaviour means that Green House Gas Emissions from transport have risen 38.8% per cent, while all other sectors achieved a reduction. Northern Ireland compares particularly badly to other UK regions: Scotland is the region of the UK most often compared to Northern Ireland, particularly in terms of the high levels of rurality and the unique challenges this presents to transport planners. However, Scotland has achieved a much lower relative increase in emissions from transport (2%).

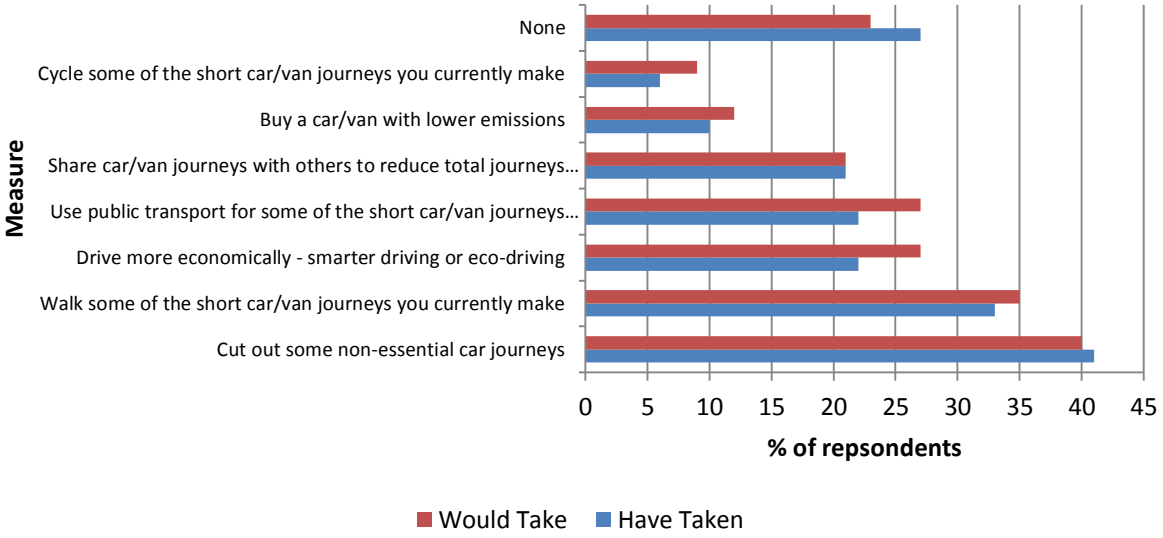
3.2 Potential for behavioural change

DRD used the Northern Ireland Omnibus Survey January 2009 to gauge public opinion on emissions caused by car and van use in order to assess the potential for behavioural change and modal shift.[23] It found that just over half of those surveyed believed they had an individual responsibility to limit car use for the sake of the environment (54%).The survey looked at what current car/van users were doing and what they would be prepared to do to reduce emissions. 41 per cent stated that they would cut out some non-essential car journeys, while 33 per cent said they would make some of those journeys by foot. Cycling was the least popular choice with less than 10 per cent saying they would choose it as a measure to reduce their emissions. Just over half the respondents (52%) who said they would be prepared to change cited increased fuel costs as their main reason; 11per cent of respondents wanted to improve their

[18] DfT (2010) National Travel Survey 2010 [online] available from: http://nia1.me/h0
[19] McKibbin, M. (2006) *Correspondence with Mr. Gregory Campbell*, Dated 6 April 2006 [online] available from: http://nia1.me/cs
[20] Olson, P. and Kelly, N. (2008) Europe's Most Congested Cities. *Forbes Magazine* [online] 28th April 2008 available from: http://nia1.me/ct
[21] DETI (2010) Labour Force Survey October – December 2009 (UK – ONS, NI – DETI) [online] available from: http://nia1.me/hi
[22] DRD (2009) Travel Survey for Northern Ireland In-depth Report 2007-2009 [online] available from: http://nia1.me/h1
[23] DRD (2009) Public Perceptions on Car Emissions [online] available from: http://nia1.me/fi

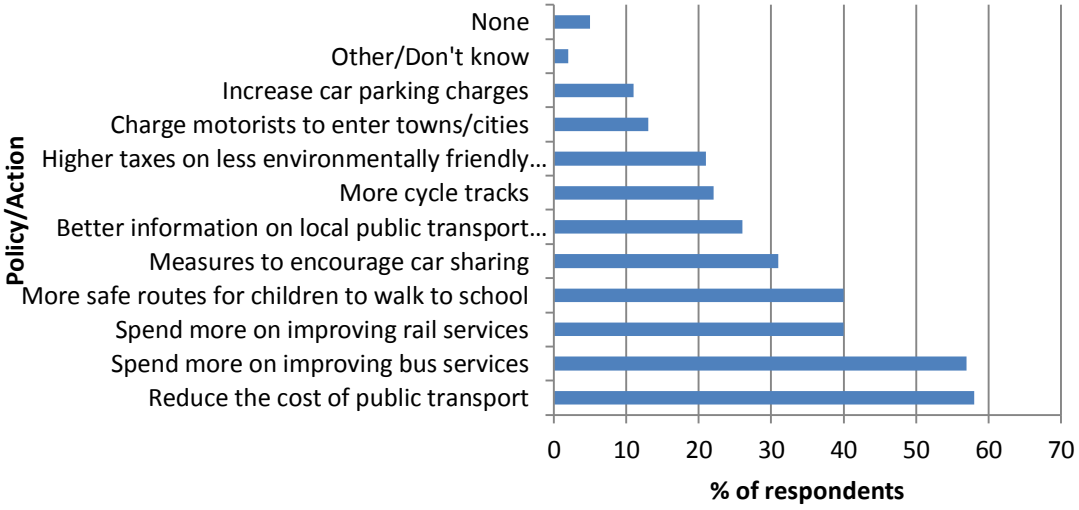
fitness; while only one in ten were concerned for the environment. In terms of measures government could take to encourage modal shift, investment in public transport and cheaper fares was most popular while just over 20 per cent felt investing in cycling infrastructure would work.

Figure 1: Measures have or would take to reduce emissions



Source: DRD (2009)

Figure 2: What could government do to encourage people to reduce their car emissions?



Source: DRD (2009)

This data suggests that government will not be able to rely on the public's environmental consciousness to significantly change travel behaviour. As it is in GB, car use in Northern Ireland is habitual, convenient and normal. It is therefore incumbent on government to make people rethink their habits – road pricing; car parking charges; congestion charges; and higher taxes have all proved successful in reducing car use in urban areas, and the data presented shows NI Drivers are sensitive to increased costs. Proposals for pricing measures are often treated with scepticism, but experience also shows that acceptance grows when people see the benefits.[24]

[24] Grush, B. (2010) A Strategy Lever For Road Use Charging: Parking Management By Sattelite. ETC Proceedings 2006

From a purely distance based perspective there is potential to increase cycling levels, particularly as a significant proportion of journeys are within the 0-5 mile range. However, the question must to be asked why no inroads have been made to change travel behaviour or increase cycling levels in the last decade. Clearly people are not currently using their bicycle to make these short journeys and it would therefore be very useful to establish exactly why this is.

Data from the continuous household survey identifies cycling as the third most popular form of physical activity in Northern Ireland.[25] This suggests that recreational cycling is widespread and popular, however, it poses another question: what reasons or barriers exist that prevent recreational cyclists becoming utility cyclists i.e. cycling not done primarily for fitness but encompassing journeys such as commuting, shopping, visiting friends relatives, and/or attending appointments.

3.3 NI Cycling Strategy

The Northern Ireland Cycling Strategy was launched in 2000, with the aim of creating a cycle friendly road network which would increase cycling. It identified a number of measures which would be taken to achieve this, including:

- The creation a network of high quality, coherent and safe cycle routes in each of the major urban areas;
- Inter urban links by way of some 850km of National Cycle Network (NCN);
- Creation of public transport interchanges, with stations and vehicles offering parking and access to bicycles;
- Compelling developers to incorporate cycling infrastructure in new residential, shopping and leisure facilities through Planning Policy Statements (PPS);
- Compelling Departmental agencies to provide cycling facilities on public land, such as forest parks; and
- Introduce a campaign of awareness building, aimed at schools, work places and the wider general public.

3.3.1 Monitoring

In June 1999 Roads Service commissioned a Cycle Usage Survey aimed at providing a representative sample of cycle usage across Northern Ireland to allow progress towards the targets established in the Northern Ireland Cycling Strategy to be monitored. The base year for the survey is the year 2000.

The Northern Ireland Cycling Strategy (NICS), targets are to: -

- Double the number of trips by cycle (on 2000 figures) by the end of 2005; and
- Quadruple the number of trips by cycle (on 2000 figures) by the end of 2015.

[25] DCAL (2010) Experience of Sport and Physical Activity in Northern Ireland [online] available from: http://www.dcalni.gov.uk/sports_bulletin_final-2.pdf

Cycle census sites were chosen across Northern Ireland to monitor progress towards these targets.[26] The timing and the duration of the survey period at each site varied from site to site and from year to year during the monitoring period. Monitoring of the cycle sites started in 2000. At that time data was collected all year round at the 13 sites on the National Cycle Network and for short periods between May and September at the other sites. Since 2003 data has been collected all year round at all of the sites but to ensure that comparisons with the previous years are consistent the ADCF figures for all years are based on the May, June and September data.

3.3.2 Results

The survey found that from May to September (2000-2009) there were significant (76.43%) increase in cycling journeys across all sites: on the NCN a 94 per cent increase was recorded while in Belfast a 146 per cent increase was recorded. Over the entire year it is clear there was a significant fall off, which could most likely to be related to seasonal changes. However, Belfast still recorded an 81.5 per cent increase in cycling journeys compared to 36.4 per cent across all sites.

While the increase in cycling journeys is welcome, the levels achieved are well below targets established in the cycling strategy, and far short of achieving the critical mass necessary to alter modal split data or reduce emissions. The second progress report suggested poor infrastructure was a factor, commenting that while off road cycling paths 'along rivers and path' may be beneficial for recreation cyclists, dedicated provision on urban roads which could be used by utility cyclists is limited. This was described as "of a lower standard, with car parking in cycle lanes and cycle lanes that do not extend through junctions".

This travel behaviour data along with information from the Cycle Usage Survey does not suggest that Northern Ireland is on the cusp of a significant modal shift that would warrant a huge investment in infrastructure. What is perhaps needed is a better understanding of what people's attitudes to this mode are. Is cycling a niche activity; is it a strictly recreational pastime; what puts people off utility cycling; and what measures would encourage people to swap their car for their bike on short journeys.

4 International experiences in increasing cycling

In some northern Europeans countries cycling is well established as a means of urban transport. In the Netherlands and Denmark in particular, more than 20% of urban journeys are made by bicycle. Most European cities experienced a decline in walking and cycling in the late 1960s and early 1970s but for some a key turning point occurred in the early 1970s, when the potential problems of spiralling car ownership began to be recognised.[27] In the Netherlands for example, political concern around road safety at a local level lead central government to support the 540 municipal and 12 provincial authorities to construct and improve bicycle facilities, such as bicycle paths, cycle

[26] Roads Servcie NI (2009) Annual Cycle Usage Report for Northern Ireland 2000 – 2009. DRD: Belfast
[27] US Department of Transportation (2010) Pedestrian and Bicyclist Safety and Mobility in Europe. DoT.

routes and complete urban networks throughout the 1970s and 80s.[28] Cycling in other European countries is, however, much more variable (see table 2).

Table 2: Variations in cycling levels in Europe

Country	Bicycle share of trips	Comments
The Netherlands	27%	The top municipalities score between 35-40%, cities with the lowest bicycle use rate between 15-20%
Denmark	19%	The difference between the larger cities are relatively small, in general the bicycle accounts for 20% of all trips
Germany	10%	The western federal states have a higher average bicycle use, especially Nordhrein-Westfalen, several cities with bicycle shares between 20-30%
Austria	9%	Top: Graz (14%) and Salzburg (19%)
Switzerland	9%	Several cities at a higher level: Bern (15%); Basel (17%); Winterthur (20%)
Belgium	8%	Cycle usage in Flanders approaches 15%, in some cities higher levels are reached, top: Bruges (20%)
Sweden	7%	Cities; 10%, extremes: Lund and Mamo (20%), Vasteras (33%)
Italy	5%	Some high levels in cities: Parma (15%); Ferrara (30%); Florence (20%)
France	5%	Top: Strasbourg (12%) and Avignon (10%)
Ireland	3%	Dublin 4%
Czech Republic	3%	A few cities between 5 and 10%; Prostejov (20%)
Great Britain	2%	Some cities with higher use: York and Hull (11%) and Cambridge (20%)

4.1 The Netherlands

In the Netherlands the bicycle is the most popular means of transportation (35%) for distances up to 7.5 km, because it the most efficient means of travelling to school, to shops and work. Bicycle use in the Netherlands also skews demographic boundaries seen in the UK with men, women and children of all ages and social backgrounds regularly cycling.[29]

> *"Large parts of the population use their bikes for all kinds of journeys. Young and old, rich and poor, to work, shop and school."*[30]

Fietsberaad, the Dutch centre for cycling policy highlight some of the other economic benefits of cycling not perhaps included in BCA: Cyclists spend approximately €750 million per year while on journeys; €400 million of this during regular bicycle trips (particularly on refreshments) and €350 million during multiday trips (particularly stopping off). The bicycle industry in relation to recreational cycling opportunities generates approximately €450 million. Fietsberaad notes the other economic effects of cycling but make no attempt to quantify them – *"cycling is an effective tool to exercise to the degree required for good health; - increase in cycling leads to a decrease in*

[28] Welleman, T (2002) An efficient means of transport: experiences with cycling policy in the Netherlands, in: McClintock H. (ed.) Planning for cycling. CRC Press, Boston.
[29] Fietsberaad (2009) Importance of cycling in the Netherlands [online] available from: http://nia1.me/h5
[30] Ibid.

health care costs; - cycling benefits the environment. Positive image of recreational cycling may help promote daily cycling."[31]

4.1.1 Cycling highways

Now that cycling dominates short journeys in the Netherlands the government is further demonstrating their commitment to this mode by investing in infrastructure to attract those making slightly longer journeys (up to 20km). €100 million will be invested in bicycle highways in the Netherlands over the next two years. It is forecast that this will lead to future annual profits of at least €144 million in travel time gained, better health and environmental benefits.

Estimates are based on two different scenarios: one involving the construction of 675 km of bicycle highways and another one with the additional assumption that by 2020 half of all cyclists will employ an electric bicycle.

- The number of car journeys will fall by 0.7% in the first scenario and if the electric bicycle continues its advance, by 1.6%.
- The number of journeys by public transport falls more: by 0.9% and 2.7% respectively.
- The number of bicycle journeys increases by 1.3 and 3.3% respectively.

The mobility effects for the region Rotterdam/Den Haag in particular were also studied individually:

- car use will decrease by 1.4 and 2.3% respectively and
- public transport by 2.3 and 3.9% respectively.
- The number of bicycle journeys increases there by 2.2 and 3.8% respectively.

For the entire country, improved bicycle provisions will cause travel times by car to fall by 3.8 million hours, as a result of less congestion, and 9.4 million hours due to increased use of electric bikes respectively.

Assuming a value of €10 for an hour's travel by car, this will yield approximately €40 million per year with bicycle highways, growing to €100 million with bicycle highways in combination with an increased use of electric bicycles.

Health benefits will contribute another €250 million to the 'electric scenario' according to the model calculation, as well as €8 million from CO2 reduction. Overall this leads to a profit of €358 million. A scenario without electric bicycles suggests a return of €144 million annually.[32]

4.2 Denmark - Copenhagen

The City of Copenhagen aspires to be the best cycling city in the world. From 2006 to 2010 the city has devoted approximately 200 million DKK (approximately 27 million

[31] Fietsberaad (2009) Picture of cycling in the Netherlands [online] available from: http://nia1.me/hb
[32] Fietsberaad (2011) Bicycle highways are profitable [online] available from: http://nia1.me/hd

EUR) to specific bicycle projects. So far the funds have been used for new cycle paths, cycle parking, redesign of intersections and media campaigns to promote cycling. Moreover, the city has introduced a range of goals for cycling in Copenhagen to be achieved by 2015. These include making more Copenhageners cycle and increasing perceived safety for the cyclists. Currently 36% of its inhabitant's cycle to work or school, and the city has committed to increasing that figure to 50% by 2015.

There is no established methodology for evaluating the economic costs and benefits of cycle projects in Denmark. For instance, the official manual for economic cost-benefit analyses from the Ministry of Transportation does not contain recommendations with regard to cycling, and there is no official methodology and no unit prices for cost-benefit analysis of bicycle projects.

In order to justify its investment the City of Copenhagen asked COWI (consultancy) to establish an initial methodological foundation for economic cost-benefit analyses (CBA) of cycle initiatives. This methodology was applied to two projects: a 200 metre long pedestrian and cyclist bridge in Bryggebroen, across the harbour of Copenhagen and the rebuilding of an urban intersection which was an accident black spot.

The schemes generated BCRs of 1:7.7 and 1:33 respectively. The economic return from the intersection was particularly high given the forecasted reduction in accidents while the return from the bridge is conservative as consideration is not given to pedestrians who will share the utility.

The results of the two case studies illustrate that bicycle projects are likely to yield a positive economic return which is (at least) comparable to road and rail projects carried out by the public sector. In some cases this will be higher, but this serves to emphasise the point that schemes must be evaluated and appraised on an individual basis as the outcomes are dependent on many variables.

4.3 Key factors for success

The majority of the European cities where cycling use is high tend to have a long history of bicycle use and bicycle friendly policies. However, this does not apply to all to the same extent and does not preclude the potential for a cycling culture to be created. The cities where cycling is most widespread share many of the same characteristics and therefore any region hoping to create a cycling culture has an invaluable template on what policies and actions work, including:

- Effective land use planning. City centres and developments are developed in such a way that trips are kept as short as possible;
- Good bicycle networks and facilities, including parking, junction priority and cycle lanes;
- Town centres tend to have (car restrictive) traffic policies to support bike use;
- Education and marketing are used continuously to maintain/generate interest;
- There is sustained political commitment and no sense of resting on laurels;

- Bicycle policies are fully integral to traffic and transport policy, because whenever plans for the bicycle are seen as totally independent from car and public transport plans, the chances for bicycle policies to be successful decline significantly;[33] [34]

4.4 Sustainable Travel Demonstration Towns[35]

In 2004 the Department for Transport (DfT) selected three Sustainable Travel Demonstration Towns (STDTs) to showcase the role of smarter choices in reducing car use. The three Towns selected: Darlington, Peterborough and Worcester shared £10 million of central funding to support the delivery of an extensive range of programmes aimed at promoting walking, cycling, public transport and car-sharing. A further 5 million was spent between the relevant local authorities, bringing the total spent on the scheme to over £15 million.

4.4.1 Expenditure

The estimated outturn cost of the programme was £11 per person per year. The exact programme of measures delivered in each town varied. Between a third and a half of the revenue spending in each location was on personal travel planning programmes; the remaining investment was made in travel awareness campaigns, schemes promoting walking and cycling, and marketing public transport. Lesser amounts were spent on workplace and school travel planning.

In all three towns, significant parts of the capital expenditure went on school travel infrastructure. And while Peterborough and Worchester had the largest capital expenditure from in this programme, spending £1.3 and £2.3 million on cycling infrastructure respectively, Darlington spent around £2.8 million, having benefited from an additional £1.5 million funding from Cycling Demonstration Town programme.

Table 4: Summary of estimated expenditure directly related to delivery of main smarter choice measures in the three towns, 2004/5 to 2008/9

	Darlington	Peterborough	Worcester	All towns
Revenue	£2,632,000	£2,642,000	£1,552,000	£6,826,000
Capital	£1,745,000	£4,160,000	£2,860,000	£8,765,000
Total	£4,376,000	£6,803,000	£4,411,000	£15,590,000

Source: Sloman, et al. (2010)

[33] Buis, J. (2010) The Economic Significance of Cycling: A survey to illustrate the costs and benefits of cycling policy world-wide. Interface for Cycling Expertise I-ce, The Netherlands [online] available from: http://nia1.me/h6

[34] Fietsberaad (2009) Bicycle policies of the European principals: continuous and integral [online] available from: http://nia1.me/hc

[35] Sloman L, Cairns S, Newson C, Anable J, Pridmore A & Goodwin P (2010) The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Summary Report [online] available from: http://nia1.me/fr

4.4.2 Outcomes

The results have been very positive, indicating that the measures do have an effect on travel behaviour, and this is evident when compared to national trends. Trends in travel behaviour for the three towns taken together, from 2004-2009, show:

- A reduction in car trips of 9 per cent (there was an estimated fall of about 1 per cent in other medium-sized towns over the same period)
- Bus trips per person increased by 10-22 per cent (there was an estimated national fall of 0.5 per cent in medium sized towns).
- Cycle trips per person increased by 26-30 per cent (against other comparable towns seeing estimated cycling trips fall by 9 per cent).
- Walking trips per person increased by 10-13 per cent (there was an estimated national decline in trips in similar towns of 9 per cent).

No economic analysis detailing a benefit to cost ratio for the STT programme has been completed, although it is possible to conclude that this change in travel behaviour led to many benefits, with considerable economic returns:

- environmental benefits from the reduction of carbon and greenhouse gas emissions;
- environmental and health benefits from the reduction in pollution;
- benefits to the health of residents from increased active travel;
- benefits for the quality of life of residents from factors such as reduced congestion and better access to transport; and
- benefits for social inclusion and more equality of opportunity, because of better access to transport for residents

Based on this, the evaluation team concluded that the programmes offered good value for money.

4.4.3 Cycling

Cycling provided the most common alternative to car use in all three towns. It also experienced the greatest (percentage) user increase (compared to walking and public transport) across all three towns. In terms of potential to replace car journeys in Darlington, 41% of local car trips could feasibly have been replaced by cycling (up from 34% in 2004), while in Peterborough the figure was 42% (26% in 2004) and in Worcester 39% (34% in 2004). These figures reflect the flexibility and range of cycling as an alternative to local car travel and show that despite the fact that there was no pre-existing cycling culture that potential exists for one to be created.

5 Conclusions

A shift in the way transport projects are appraised by government was an important breakthrough in realising the wider benefits of cycling. Transport policy had historically been biased towards cars with no established methodology for calculating the cost and benefit of cycling schemes established until 2009.

In terms of transport, cycling and walking are unique, as they directly impact on our health and have no negative environmental impacts. Analysis of a number of cycling schemes found that improvements to physical fitness, ambience and reduced congestion brought the greatest returns while overall returns form cycling projects compared very favorably to other transport schemes.

These returns are based on a number of variables, including: the number of additional cyclists (and additional trips); the profile of target group cyclists; and the number of cycle trips that replace car trips. Because of this all projects must be considered on an individual basis. In calculating the Benefit to Cost Ratio for prospective projects forecasts must be made based on these variables, therefore the accuracy of these is questionable.

In the context of Northern Ireland car use is habitual, convenient and normal to the extent that car restrictive policies such as road pricing; car parking charges; and/or congestion charges may need to be considered. There does appear to be the potential to increase cycling levels on short journeys, but previous actions designed to do this have failed to meet targets. One positive is that cycling is a popular form of recreation and it would therefore be beneficial for further research to assess what barriers exist to making the move from recreational to utility cycling.

Experience from Europe shows that cycling cultures can be created but many cities are 30 years ahead of Northern Ireland. Policies and actions which have shown to work include:

- effective land use planning;
- good bicycle networks and facilities;
- car restrictive policies;
- continuous Education and marketing;
- sustained political commitment; and
- Bicycle policies that are fully integral to traffic and transport policy.

Sustainable Demonstration Towns and Cycling Demonstration Towns provide strong evidence that cycling is a viable alternative to the car for local travel and demonstrate that levels can be increased through a mixture of government policies. It remains to be seen if a ‘cycling culture’ similar to that which exists in Europe can be created in Northern Ireland.